DOCUMENT RESUME

ED 217 380 CS 006 684

AUTHOR Lyttle, Catherine Cummings
TITLE The Effects of the Use of Trade Books in the Content Area Science.
PUB DATE May 82
NOTE 83p.; M.Ed.Thesis, Rutgers The State University of New Jersey.

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Academic Achievement; *Childrens Literature; *Content Area Reading; *Elementary School Science; Grade 4; *Interdisciplinary Approach; Intermediate Grades; *Reading Research; Scientific Attitudes; Supplementary Reading Materials; Textbook Research
IDENTIFIERS *Tradebooks

ABSTRACT

A study examined the effects of using a form of children's literature known as tradebooks on students' science achievement and attitudes. Subjects were 47 fourth grade children. For 6 weeks the experimental and control groups progressed through the objectives of a science unit on animal and plant populations. The control group used the textbook and the experimental group used tradebooks selected to meet the objectives of the unit. Upon completion of the science unit, each group was tested with the alternate forms of the textbook achievement test and an attitude measure. In addition, a true-false achievement test was designed to balance any bias towards the control group that used the textbook. Findings indicate that there was no difference in achievement or attitude between members of the control group and the experimental group. (Appendixes include the textbook achievement tests and the true-false achievement test.) (HOD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED217380

THE EFFECTS OF THE USE OF TRADE BOOKS IN THE CONTENT AREA SCIENCE

A THESIS

SUBMITTED TO THE FACULTY

OF THE GRADUATE SCHOOL OF EDUCATION

OF

RUTGERS

THE STATE UNIVERSITY OF NEW JERSEY

BY

CATHERINE CUMMINGS LYTTLE

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE

OF

MASTER OF EDUCATION

NEW BRUNSWICK, NEW JERSEY May, 1982

APPROVED: Joseph Zelnick
Joseph Zelnick

Kathleen Garland
Kathleen Garland

George Pallrand
George Pallrand

DEAN:
Irene Athey

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Catherine Cummings Lyttle
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CS006894

ACKNOWLEDGMENTS

This is the most pleasant aspect of writing a thesis: thanking all the wonderful people involved in the whole process.

A deep thanks to the faculty of the Reading Center at Rutgers. Dr. Edward Fry, my advisor, guided me in my studies. Dr. Joseph Zelnick, my thesis chairman and a fellow believer in children's literature, demanded the best from me, and it was a pleasure to produce for him. My thanks also to my committee members, Dr. Kathleen Garland and Dr. George Pallrand, for their support and helpful comments.

Without the cooperation of the students, teachers, and administrators in Sayreville, New Jersey, this study would not have been possible. Thanks to Mr. Henry Counsman, superintendent, and Mr. Roy Dill, principal of Arleth School. My greatest appreciation is extended to the fourth grade students at Arleth School and their teachers, Mrs. Arlene O'Connor and Miss Eileen Drennan. I know they worked eagerly while studying animals and plants.

Gathering of the books could not have been done as easily without the aid of a terrific librarian and friend, Mrs. Karen Perno.

Dr. Jeffrey Smith deserves a sincere thanks for all the patience he has shown and statistical help he gave.

Thank you to Aldona Skrypa for helping in the pilot study of the achievement measure.

Thank you also, to Sandy Chubrick for typing this thesis and for keeping me informed.

On a personal note, thanks to Donna and David Cox for believing in me and what I set out to do. Thanks also to Linda Gurovich and Grace Gabriele, who throughout the years, tried and proved that children's literature is a great educational tool.

To Bill and Phyllis Halloran, I thank you for first instilling in me a knowledge, appreciation and love of children's books. This gift you have given me will be shared with all I meet.

No person ever completes a study alone. But the most crucial support comes from one's spouse. To David Lyttle, no thanks could be enough for all the nights spent researching through the library with me, for putting up with books and papers piled high in the kitchen, dining room, living room..., for hand-holding during those traumatic moments, for cooking so many meals, but even more so, for supporting what I choose to do, and for believing in me as no one else has ever done. Thanks for always being there!

TABLE OF CONTENTS

		Page
ACKNOWLEDGMENTS		ii
LIST OF TABLES		vi
Chapter		
I.	INTRODUCTION	1
	Hypotheses	4
	Importance of the Study	4
	Definition of Terms	6
	Limitations of the Study	6
	Overview of the Study	7
II.	REVIEW OF LITERATURE	9
	Trade Books in Science: Research Studies	9
	The Relationship of Science and Literature	13
	Readability and Meeting the Needs of All Learners	14
	Covering the Up-to-the-Minute "Information Explosion"	16
	Enrichment, In-Depth Look at a Topic, and Expansion of the Individual's Interest and Creativity	18
	Relationship to Everyday Life	19
	Emotional Involvement	20
	Awareness of Future Scientific Endeavors	21
	Exposing the Realities of Science	22
	Summary	23
III.	PROCEDURES	25
	Selection of the Subjects	25
	Construction of Tests	27
	Achievement Tests	27
	Attitude Tests	29
	Reliability of the Measures	30
	Pilot Study of Textbook Achievement Test	30
	Materials	31
	Experimental Design	33

TABLE OF CONTENTS--Continued

Page

Scoring 34
Analysis of Data 35

IV. FINDINGS AND DISCUSSION 38

Analysis of Mean Scores 39
Findings 39
Discussion 39

V. SUMMARY AND CONCLUSIONS 43

Conclusions 44
Suggestions for Further Research 45
Discussion 46

BIBLIOGRAPHY 48

APPENDIX A - TEXTBOOK ACHIEVEMENT TESTS
Form A, Form B 51

APPENDIX B - TRUE/FALSE ACHIEVEMENT TEST 64

APPENDIX C - A SCALE TO MEASURE ATTITUDE TOWARD
ANY SCHOOL SUBJECT, Form A, Form B 68

APPENDIX D - TRADE BOOKS USED BY EXPERIMENTAL GROUP . . 73

LIST OF TABLES

Table		Page
1.	Mean Scores on Short Form Test of Academic Aptitude and California Achievement Test, Reading Section for Control and Experimental Groups	28
2.	Mean Scores On Textbook Science Achievement Tests Form A and Form B By Pilot Study Group	32
3.	Mean Scores of Control and Experimental Groups On Pretest Measurements of Achievement and Attitude	36
4.	Mean Scores of the Control and Experimental Groups On Posttests to Measure Achievement and Attitude	40
5.	Analysis (T-Test) of Mean Scores on Achievement and Attitude Measures	41

CHAPTER I

INTRODUCTION

As we head towards the twenty-first century, as we send sophisticated vehicles through space that return for a "jet" landing, as advancements are made in medicine, heredity, and technology, we are required to look at and examine the school science curriculum.

Science developments in this half of the century alone, boggle the mind! We are in an "information explosion" (Chambers, 1971, p. 100)! Our young children will face even greater achievements in their lifetime. A scientific education may prove to be necessary.

McFarland (Chambers, 1971), science educator at the State University of New York at Fredonia, believes "Science should be taught as one of the humanities because it is a tool that man uses to understand himself and his world" (p. 73).

It seems obvious and essential that there should be an increased emphasis on the school science curriculum.

Traditionally, science programs are centered around a textbook. The textbook chosen for a grade level is usually meant to be used by all students at that grade

level. Often supplementary materials, like workbooks, experiment guides, and lab kits, are included in the textbook package.

Chambers (1971) suggests that such a package is not enough. Texts were never meant to reach and teach all the students at a grade level, but rather, texts were meant to fit the average student at that grade.

Trade books can enhance a science project, better meet the needs of a variety of reading levels, provide a more inviting format and a selection of writing styles. Chambers (1971) states that trade books can deal with a topic in science more deeply than can a textbook. Texts are often limited to a few paragraphs about a topic, whereas, a trade book can delve more extensively. For example, there are trade books devoted solely to organisms and their environments. Several used in this study were: See Through the Forest (Selsam, 1956), Who Lives in This Log? (Ross, 1971), In the Wilds of North America (Halmi, 1971), Camels (Cloudsley-Thompson, 1980), Endangered Animals (Morris, 1977), and A Chick Hatches (Cole and Wexler, 1976).

It is natural for children to be curious and to ask questions about the world around them. The arousal of curiosity and the search for answers are characteristics of scientists also. Huck and Kunh (1968) state:

> Inquiry training, processes of discovery, and science skills are currently stressed

> in the science curricula. Concepts are held too difficult for children are included in primary grades. (p. 582)

Huck et al. (1968) continue:

> As the author presents the facts, the young child should sense the curiosity and excitement about discovery that is the integral aspect of science. (p. 582-3)

In addition, Chambers (1977) adds:

> The science curriculum...is natural for this kind of activity. Children are fascinated with the world and all that it contains. They are enchanted with animal life and all the secrets that nature holds for those who will seek. They ponder the physical sciences and are amazed at the energy the natural world holds in reserve. (p. 97-8)

Literature can broaden appeal and bring deeper understanding of concepts, often allowing a child to experience his world, frequently answering puzzling questions and even sparking interest for further research and experimentation. "Children's science trade books have abandoned the pseudo-scientific stories and watered down terminology of a decade or so age and have adopted instead a kind of seriousness that children and adults alike can appreciate" (Arbuthnot, 1964, p. 579).

Trade books can provide diversity and interest. Children need more opportunity to satisfy their curiosities, to observe and to explore their world. Trade books can add new dimensions to the satisfaction of these curiosities.

Children learn many concepts for life's realities from

play. Erickson's definition of play is "the infantile form of human ability to deal with experiences by creating model situations and to master reality by experiment and planning" (Wundeiler, 1967, p. 26). We want children to read, and, therefore, sometimes their books should subserve play. Reading a trade book can be a recreational activity, and, is therefore, similar to play.

Hypotheses

Two hypotheses were proposed.

1. Presentation of instructional content is enhanced by a literature-based approach as opposed to a textbook-based approach, as shown by an achievement measure.

2. Presentation of instructional content is enhanced by a literature-based approach as opposed to a textbook-based approach, as shown by an attitude measure.

Importance of the Study

Teachers attempt to reach all of their students. However, a single-textbook strategy often cannot reach all the needs of each student. Therefore, supplementation is frequently necessary. To meet the needs of most students, a good selection and range of levels can be found in trade books. In this study involving animal and plant organisms, the following books were used, and are examples of the selection and range available: What's Inside of Plants? (Zim, 1952) grade 3, Plants with Seeds (Wood, 1963) grade 3,

Look at Flowers (Kirpatrick, 1978) grade 2, Wonders of the Cactus World (Lavine, 1974) grade 7, Play with Plants (Selsam, 1949) grade 4, See Through the Jungle (Selsam, 1957) grade 5, Camels: Ships of the Desert (Waters, 1974) grade 4. Readability levels were calculated using the Fry (1977) Readability Graph.

Texts are bound to a certain number of pages on a certain topic. Often children want and need further information. Trade books devoted to a single topic can adequately fulfill such needs at the child's reading level.

Kuslan and Stone (1972) suggest:

> Reading is a vital part of elementary science instruction. Reading has always been important in traditional science teaching, however, children read because they need to read - they seek information! But in addition, if the classroom has an adequate supply of science trade books... for children to pick up and browse through, if the teacher frequently picks up and reads these books because they are particularly striking, if she frequently suggests to her children certain books she thinks they will find interesting, and if she is a model for them to follow, the chances are great that the children will read for enjoyment as well as for information. (p. 316)

Using trade books in the elementary science curriculum alone or in partner with the text will enliven interest in the topic, will develop a positive attitude toward science, will broaden the depths of viewpoints and concepts understood, and will stimulate independent study.

Trade books will provide an "educational cafeteria where the student can taste and sample many scientific fares and likely develop a taste for a certain field that can develop into a valuable, long range interest" (Chambers, 1971, p. 89).

Chambers also suggests that it is our duty to recognize children's literature as having a dynamic and meaningful impact on curricula, especially science. "Ignoring trade books as a resource in content area study is to ignore the principles of modern learning theory" (p. 85).

It is, therefore, the purpose of this study to show educators the value, cognitively and affectively, in the use of trade books in the content areas.

Definition of Terms

Trade books are defined as library books, not a textbook or reader which are included as or part of a graded or developmental series. For this study, they will also be referred to as children's literature.

Textbooks are those books which are part of the school curriculum that are designed to teach all the children in a class or group, with skills and concepts presented in a single book.

Limitations of the Study

The limitations of this study were:

1. This study was conducted with a small group sample.

Therefore, the results may not be generalizable to the whole population.

2. This study was conducted within one school district. Therefore, the results may not be generalizable to the whole population.

3. This study was limited to one aspect of the elementary school science curriculum and therefore, may not be generalizable to the entire science curriculum.

4. The selection of trade books was limited to the availability, quality and quantity of books on this topic.

5. This may not be an equivalent-control group. Randomization was not possible. The selected classes had a predetermined membership.

6. Because of the design of this study, the experimental group may have read more than the control group. More books on each topic were available to the experimental group. The control group was required to read about each topic from the selection in the text.

Overview of the Study

Chapter II covers the review of the literature as it applies to the use of children's literature in the content area. Also included are the opinions of well-known specialists in the fields of literature and science.

Chapter III discusses the procedure for this study. Included are descriptions of the study's design and the

subjects of the study, discussion of the measures of achievement and attitude, and the actual procedures for the use of the text in the control group and the trade books in the experimental group.

Chapter IV discloses and discusses the findings of this study. The resulting data is presented and analyzed. Significant differences are explained. Comparison is made with the viewpoints of specialists in the fields of science and literature.

Chapter V presents the summary and conclusions. Suggestions for further research are also given.

CHAPTER II

REVIEW OF LITERATURE

The use of children's literature in the content area is encouraged in many books authored by specialists such as Arbuthnot (1064), Chambers (1971), Huck (1968) and Sutherland (1977). One can find evaluations of trade books for use in the science curriculum in such periodicals as the March issue of Science and Children, the December issue of Scientific American, the November issue of Natural History and monthly articles in Horn Book Magazine. Articles about the use of trade books in science can be found in periodicals, such as The Reading Teacher (Troy, A. Literature for content area learning. The Reading Teacher, 1977, 30, 470.), and Science and Children (Main, E. Interrelating science with other subjects. Science and Children, 1981, 18, 26.).

As educators we are encouraged to use the trade books in content area studies. However, there is little research to verify the effectiveness of such a program.

Trade Books In Science: Research Studies

Barrilleaux (1967) investigated the use of library sources versus a textbook in junior high science. His

longitudinal study compared the effects of the use of library materials in relation to library utilization of eighth-grade students until the end of ninth grade. Two groups of eighth graders were matched in mental ability and preference for science. The control group followed the course outline in their science textbook. They were encouraged to use the library for further readings and reference materials. The experimental group followed the same planned sequence of topics as the textbook group, but rather than use the science text, they used reference materials and trade books in the school library. The experimenter was the teacher of both groups and reported his teaching reflected the same level of enthusiasm and interest for both methods.

Assessments in science achievement and attitude were obtained at the end of eighth grade and at the end of ninth grade. Using the Iowa Tests of Educational Development (ITED) as a means of determining science achievement, statistically significant differences resulted, with the library materials group superior to the textbook group. Science attitude, as measured by the Test on Understanding Science, was significantly higher for the library materials group.

Barrilleaux's study gives evidence that "it is possible to modify the program of junior high school science

instruction to a more flexible one where students as individuals may select from a range of printed materials and perform as well or better in attaining desired outcomes of science instruction" (p. 35). While Barrilleaux is not suggesting the abandonment of textbooks, he does stress the need for more effective use of printed materials, trade books included. "Children's feelings and attitudes about concepts they learn are more positive when literature is used..." (Fisher, 1980, p. 173).

Fisher (1980) patterned an experiment after Barrilleaux. She integrated the use of science trade books into a life-science unit on cells, anatomy and physiology in the seventh grade. The Experimental group 1 had free use of the trade books; Experimental group 2 was required to read selected trade books; the Control group was not prevented from, nor encouraged to read trade books. At the end of nine weeks both cognitive and affective assessments were made. The results showed that the students enjoyed reading parts of the trade books rathen than an entire textbook. She also reported that the use of the trade books stimulated conversations about the topics studied. In general, the high ability students favored the required readings in the trade books, enjoyed the challenge and extra up-to-date information. The low ability students enjoyed the unrestricted readings in trade books because they felt free to read without pressure. Fisher reported

that when the trade books were used science was more a part of real life and not just academia.

In a study by Cohen (1968) the use of trade books in content areas increased vocabulary, word knowledge, reading comprehension, and vocabulary quality with second graders in New York City. Cohen's conclusions strongly urge teachers to have children read from trade books.

Interrelating science and literature can provide many positive benefits for children. In her master's thesis, Main (1981) concluded that when "subjects are interrelated, children increase their insight, understanding and motivation...student's attitudes towards learning are more positive and their achievement is higher" (p. 26).

These studies indicate, then, that the use of trade books with students makes the concepts they are learning more meaningful, helps increase understanding, and gives the students a variety of sources from which they can obtain information.

The results of other research supports more advantages for using trade books in the content ares of science. These advantages will be explored next. They include: the relationship of science and literature, readability and meeting the needs of all learners, covering the up-to-the-minute "information explosions", enrichment, in-depth look at a topic, and the expansion of the individual's interest

and creativity, the relationship to everyday life, emotional involvement, awareness of future scientific endeavors and exposing the realities of science.

The Relationship of Science and Literature

In his book, Children's Literature: Strategies of Teaching, Whitehead (1968) says, "Literature can be correlated easily and in diverse ways with almost all areas of the curriculum. Units can be developed around most types of books found in the library" (p. 78). This can be applied to science as shown by Barrilleaux's study.

Children have an enthusiasm for trade books. This feeling is rarely found towards a textbook. "Teaching through a greater emphasis on literature seems a partial answer to the problems of materials, methods and interest in reading" (Troy, 1977, p. 470).

Gross and Mayo (1969) participated in a 1968 program to develop more effective curriculum and preparation for elementary science teachers. Three qualities they felt a teacher brings to the classroom are: substance (the traditional subject matter of science), structure (organization of the curriculum), and style (what he/she does with the curriculum).

Gross and Mayo then suggest four criteria for classroom teaching: 1) students must be involved, 2) they must

experience success, 3) materials must be written within the range of the students' comprehension levels, 4) the concepts being investigated must be just as applicable to the present and the future as to the past.

In order to meet the qualities and criteria suggested "teachers must view science as an integral part of the entire social and cultural milieu. They should be able to interrelate several disciplines into a broader picture" (p. 24).

The Gross and Mayo study shows the concept of integration is important. Using trade books to interrelate science and literature is an example of integration. "The relationship between science and children's literature is a complementary one" (Brice and Fox, 1977, p. 18).

Readability and Meeting the Needs of All Learners

In a study by Mallinson, Sturm and Patton (1950) Kerr deals with a common misconception:

> There is still a feeling on the part of many teachers that the only subject that needs carefully graded materials is reading...Since science...presents many concepts which are remote in space and time, it is important that reading difficulties do not further complicate the problem. (p. 460)

Mallinson et al. (1950) did a study of science textbooks in grades four, five and six from five different publishers. They used the Flesch formula to determine the

readability level of each of the fifteen texts.

The average readability level of the five texts written for use in the fourth grade was above the level which could be expected from the average fourth grader. The texts therefore, were too difficult for the intended audience.

This exemplifies the problem that can be encountered when using a single text in a content area. Teachers are faced with finding supplemental materials that are within the range of reading levels of their students.

The text that is used by the subjects of this study is Elementary Science (Abruscato, Fossaceca, Hassard, and Peck, 1980). A readability of this text was done using the Fry Graph for Estimating Readability (Fry, 1977); with consideration taken for Fry's recent revision (1979) of his formula as it pertains to content area texts. The results indicated the text to be on a fourth-fifth grade level.

This would indicate that teachers using this text with an average fourth grade class may find that their students have difficulty comprehending the text. They, therefore, may need to supplement.

Carin and Sund (1970) in their book, Teaching Science Through Discovery, admit that "one of the most glaring limitations of science textbooks in the elementary school is the problem of readability" (p. 159). McWilliams and

Rakes (1980) agree that "a frequently cited reason for low student achievement in science is the inability of students to read their textbooks" (p. 521). Readability of textbooks provides teachers with a problem. The solutions may be the use of trade books.

Educators must also provide for the various cognitive learning styles of their students. This can be done through the use of trade books (Keach, 1974). Trade books can be the answer for remedial students, for trade books are available with high interest and low readability. Because generally trade books are smaller than a thick textbook, they appeal to the reading underachievers (Lembesis, 1965). Trade books can be found to meet the reader's independent and instructional levels.

Trade books can also be read to children. This practice of sharing sections from science trade books is particularly valuable for children who are not good readers (Kuslan and Stone, 1972).

Reading is an important part of the science curriculum. It is therefore, our duty to provide books that our students will be able to read and from which they can obtain meaningful information.

Covering the Up-to-the-Minute "Information Explosion"

Chambers (1971) stresses that science advancements

in this century "boggles the mind" (p. 100). Our young children today will face even greater technological and medical achievements within their lifetime. Just to cope with all that they will face, they need a scientific education. The textbook can provide some of this background; however, textbooks cannot keep up with the ever-increasing advancements. Because of the cost factor, it is impossible for a school district to buy new texts each time the present one becomes obsolete due to new scientific findings.

Textbooks presently being used may be outdated, as they take several years to write and publish. Because of the investment, textbooks are expected to be used for several years. Supplementation, however, can be made through the use of current trade books. "The well-written trade book can provide extended, up-to-date information not found in textbooks" (Huck and Kuhn, 1968, p. 583).

Frye (1964) agrees, "Scientific textbooks are not enough. Discoveries and theories are produced so fast today that even the most frequently revised textbooks cannot include them as they come along" (p. 28). Keach (1974) adds that "in the world in which our pupils keep abreast of those changes...Tradebooks must be used to supplement..." (p. 100).

Textbooks are outdated quickly. Consider the latest

space explorations of Jupiter and Saturn and the recent success of the space shuttle. It is easy to see, then, the effects of our information explosion. Trade books can be used to keep our information current.

Enrichment, In-Depth Look at a Topic, and Expansion of the Individual's Interest and Creativity

Trade books can be used with textbook lessons as a step beyond, as a source of further information. Trade books can delve more deeply into a topic, indeed more deeply than the few short paragraphs or pages devoted in a text. A child can explore on his own through trade books. In class he may become aware of a topic that he would like to research in depth. Trade books can be a valuable resource in his search.

The feeling that trade books can provide the enrichment, stimulation and spark for individual pursuits is present in the views of many who study literature and its relationship to curriculum. Brice and Fox (1977) believe, "Literature of all kinds provides a medium of enrichment for science learnings" (p. 18). "If the teacher allows and even encourages individuals to branch out from the main unit of study according to their interests and abilities, he must be ready to guide the students in a variety of materials and activities. The single science textbook will not suffice...use trade books" (Carin and Sund, 1970, p. 161). Billig (1977 agrees that trade books can enrich

and enhance understanding and achievement in science. Keach (1974) and Moore (1966), too, feel that trade books have a purpose in the stimulation of interest for the young science reader, to develop "the observer and experimenter in the child" (Troy, 1977, p. 471).

Besides providing a greater view of the topic, trade books can also supplement textbooks as sources of information. It is important that students be aware of the fact that textbooks may contain inaccuracies and misconceptions. (Carin and Sund, 1970) Students can research the information in trade books and compare viewpoints and data. This is an important critical reading skill easily taught and practiced through the use of trade books in science.

Relationship to Everyday Life

Trade books can broaden and strengthen the real-life experiences of the child. The use of trade books can help to stimulate hobbies related to science. Children can get help in interpreting the environment they explore while camping, hiking or on vacations. Trade books can provide answers to the questions that are aroused during these experiences. Stewig (1980) in his book, Children and Literature, states that trade books can help the child understand an environment different from his own. Thus, through trade books the child can read and explore the desert, jungle and oceans.

Trade books can also provide information to the child

in relation to the things that are happening in the world around him or her. The birth of a litter from the family's pet can be prepared for with books like The Birth of Sunset's Kittens (Stevens, 1969) or How Puppies Grow (Selsam, 1971). After a walk in the woods questions can be answered with books such as Who Lives in This Log? (Ross, 1971). Camels: Ships of the Desert (Waters, 1974) may be of help when curiosities are aroused after a trip to the zoo. Books can help extend the real-life experience.

Emotional Involvement

Many topics in science do arouse the emotions, especially when related to disease prevention, ecology, and health care. Teachers may have considered science and literature to be at opposite ends of the emotion and curriculum spectrum. Science has been viewed as an experimental, objective, unemotional subject. Literature has been viewed as a subjective, aesthetic and emotional subject. (Fisher, 1980) Books can help the child see the emotions in science, whether it be through the struggles portrayed in a scientist's biography or through an animal story on the effects of pollution and waste by humans. Trade books can help to clarify emotions.

Children need trade books that tell of the beauty of nature as well as the destruction caused by some human carelessness.

> Good science books help children to be aware of the world around them and make it possible for them to discover pleasure and happiness by becoming more conscious of the beauty of their immediate world. (Troy, 1977, p. 471)

But on the other hand,

> Children need books to make them fully aware of the danger of losing their natural heritage. So, along with the books of beautiful color photographs of nature...let them also have picture books of the devastated earth, of lumbered and burned-over areas, of birds dying in the oil slicks along the coasts, of fish gasping for air in lakes so polluted that they can no longer sustain life except algae, of skies lost to sight in the smog over cities and of children in those same cities wearing gas masks. (Eakin, 1970, p. 28)

Trade books can provide the forum for emotions as they relate to topics in science - a forum far beyond the factual presentations in textbooks.

Awareness of Future Scientific Endeavors

Another advantage of using trade books in science is to create an atmosphere for developing an appreciation of scientific achievements. Well-known science author, Issac Asimov (1964), believes that science fiction can stimulate interest and creativity in its readers, making them tomorrow's creative scientists. Billig (1977) believes that "fantasy can provide the impetus for scientific research and experimentation" (p. 856).

Kuslan and Stone (1972), too, feel

> the portrait of the scientist in science fiction tends to be optimistic, favorable and worthy of emulation. Science fiction frequently deals with the theme of a new world shaped by the application of trained intelligence. In this respect science fiction is a worthy vehicle for inculcating desirable scientific attitudes. (p. 322)

Science fiction fantasy presents the possibilities of many miraculous machines. Through these thoughts, many real inventions can be born. For decades, traveling through space had been a recurring theme in many science fiction books, and today, it is becoming an ever-present reality. The use of trade books, then - in this case, science fiction - can open the door for many a creative youngster.

Exposing the Realities of Science

Texts include mainly facts and explanations, in addition to questions and quizzes. Rarely is time and space devoted to the lives of the scientists - those men and women responsible for the discoveries and inventions which are part of the elementary science curriculum. Trade books, more specifically, biographies, make scientists and their contributions real. Biographies help the reader to understand the achievements in science and the methods of science. The reader is able to see the problems and handicaps that many scientists have had to overcome.

> It is our best of juvenile literature that the men of history come alive with their problems, motivations, achievements, even failures and inherent weakenesses. It is a trade book, carefully authentic, that can reveal great men as persons and clearly indicate to its reader the ideals, goals, behavior that he himself may well emulate. (Dawson, 1965, p. 297)

Trade books do serve a purpose, then, in making science "real" and "alive" to the reader. Science is constantly growing and changing. Encouragement to be a part of all the action can be received from trade books.

Summary

Science and literature can be interrelated. This can make the learning of concepts more meaningful and increase understanding. Research has shown that readability of texts can be a problem. Supplementing lessons with trade books can prove additional sources of information on a variety of levels. The production of textbooks is costly and requires time. To keep up-to-date with current happenings in the scientific world, trade books can be used. Entire trade books can examine topics in a greater depth than a text. Trade books can tie real-life experiences into the curriculum. Emotional issues that relate to science can find a forum in trade books. The lives of scientists can provide youngsters with further information about discoveries, but even more importantly, biographies can provide a role model.

Trade books can provide all or "nearly all of the concepts and generalizations a cognitive type of analysis can yield. But in the literature their cognitive categories are synthesized. They are a whole symphony - a structured rendition that transcends basic human activities and presents instead, the life and lives themselves" (Sebesta, 1970, p. 29).

CHAPTER III

PROCEDURES

This study was concerned with ascertaining the effects of using children's literature, also known as trade books, on achievement and attitude in the content area of science. The study involved a unit called "Animal and Plant Populations."

In this chapter the procedures are described for the selection of subjects, the construction of the achievement tests and its pretesting with a pilot group, the construction of the attitude measure, the selection of the books for the experimental group, the administration of the tests, and the methods by which data were analyzed.

This study was conducted for a period of six weeks, from January through February 1982.

Selection of the Subjects

The subjects participating in this study were 47 fourth grade children from a suburban New Jersey public elementary school. They range in age from 9 years 1 month to 10 years 7 months.

The community surrounding the school is comprised of single-family, development homes. The population consists

of middle class families with predominantly professional and blue collar workers as heads of households. According to the 1970 Census (U. S. Department of Commerce, 1971) there were 8,200 families in the community of which 94% have a salaried income, 7% are self-employed, 14% receive their income from social security, and less than 2% receive public assistance or welfare. Statistics show that average income per family is $12,863, with $3,388 per capita. The total population of the community is 32,508, with almost equal distribution between males and females.

The school does not qualify for Title One funds. Following state guidelines for eligibility, 6.6% of the students qualify for partially subsidized lunches, and 4.6% qualify for fully subsidized lunches.

The total school population is 453 students from Kindergarten through sixth grade. The school also has one class of educable mentally retarded and one class of multiple handicapped children.

The subjects were tested in March 1981 with the California Achievement Test (CAT), Form C. Scores ranged from grade 2.3 to 5.8 on the vocabulary subtest, 2.3 to 6.7 on the comprehension subtest, and 2.6 to 7.0 on the total reading section. IQ's ranged from 89 to 137.

The two groups of fourth graders used in the study were intact classes. Members of each class were assigned randomly in September 1981, by the principal with input

from the third grade teachers and the reading specialist.

Class 4^1 was the control group. Twenty-four members of this class participated. They used their regular science texts for the unit on Animal and Plant Populations. The March 1981 CAT mean grade scores were 4.44 on the vocabulary subtest, 4.76 on the comprehension subtest and, 4.70 on the total reading section.

Class 4^2 was the experimental group. Twenty-three members of the class participated in this study. They used various trade books to meet the objectives of the science unit on Animal and Plant Populations. The March 1981 CAT mean grade scores were 4.83 on the vocabulary subtest, 4.92 on the comprehension subtest, and 4.86 on the total reading section. The results are shown in Table 1.

Construction of Tests

Achievement Tests

Holt, Rinehart and Winston publish a test for use with their Elementary Science series. Since Unit 4 in the text, "Animal and Plant Populations," was used for this study, and since this unit consisted of Chapters 15, 16 and 17, the textbook tests for those chapters were used as a basis for constructing one of the achievement test instruments for both the control and experimental groups. Two forms of the test were made.

TABLE 1

MEAN SCORES ON SHORT FORM TEST OF ACADEMIC APTITUDE AND CALIFORNIA ACHIEVEMENT TEST, READING SECTION FOR CONTROL AND EXPERIMENTAL GROUPS
N=47

Group	Vocabulary Subtest	Comprehension Subtest	Total Reading Section	I.Q.
Control				
mean	4.44	4.76	4.70	110.58
s.d.	.96	.99	1.1	10.87
Experimental				
mean	4.82	4.92	4.86	114.83
s.d.	1.01	1.27	1.18	11.94

Each of the end-of-the chapter tests consisted of 15 multiple choice questions and two essay questions. Thus, a bank of 45 multiple choice items and six essay questions were available. Each was assigned alternately to Form A and Form B. The resulting forms each had 22 multiple choice items and three essay questions. One multiple choice question was discarded. A copy of each form is in Appendix A.

Both pre- and posttests were given. The control group received Form A for the pretest and Form B for the posttest. The experimental group received Form B for the pretest and Form A for the posttest.

To avoid a bias towards the textbook group by having the test solely from the textbook, another test for achievement was designed. After examining the objectives for the unit in "Animal and Plant Populations," twenty-five true/false questions were written. This test was administered as another check of achievement. A copy of this test is in Appendix B.

Attitude Test

This study also investigated the effects of the use of trade books compared with textbooks upon attitudes toward science. The instrument to measure this was A Scale to Measure Attitude Toward Any School Subject (Remmers, 1960) from the Purdue Master Attitudes Scales.

The test consists of 17 statements. The examiner read aloud each statement. Further explanations were given by the examiner, but no indications were made towards a particular response. The students were asked to place a plus sign (+) next to the statements with which they agree as they relate to the school subject science. The original full-length scale had a reliability that ranged from .71 to .92. Based on Hancock's study (Remmers, 1960) reducing the scale to a lesser number of items does not lower the original reliability. This test has a Form A and Form B. The control group received Form B for the pretest and Form A for the posttest. The experimental group received Form A for the pretest and Form B for the posttest. Copies of both forms are in Appendix C.

Reliability of the Measures

The reliability of the two achievement measures and the two attitude scales was determined through the use of Coefficient Alpha. The reliability of the textbook tests were: Form A, .47 and Form B, .70. For the true/false achievement test, the reliability was .65. The reported reliability of the Purdue scale, A Scale to Measure Attitude Toward Any School Subject (Remmers, 1960) is from .71 - .92.

Pilot Study of Textbook Achievement Test

A pilot study of the textbook achievement test was

conducted by administering the test, Form A and B randomly, to a group of 24 third graders and 24 fourth graders in a public school from a suburban, middle-class population in New Jersey.

Teachers randomly assigned Forms A and B to the class members. Mean scores for Form A were 14.36 for third graders and 15.54 for fourth graders, with a total mean of 15 for Form A. Mean scores for Form B were 13.24 for third graders, and 19.16 for fourth graders, with a total mean score of 16.21 for Form B. The means of Forms A and B were analyzed with a t-test. A t-test is a statistical test that allows comparison of two means to determine the probability that the difference between the two means is real and not a chance difference. (Tuckman, 1978) The results of the t-test indicated that there was no significant difference between Form A and Form B. The results are shown in Table 2.

Materials

The science text used by the control group was Elementary Science (Abruscato, Hassard, Fossaceca, & Peck, 1980). This group studied Unit 5, "Animal and Plant Populations" which consisted of "Living Things," "The Size of the Population," and "Survival and Change." The control group progressed through the text as usual, following suggestions that the text gave for experiments, observations and lesson extensions. The time spent was

TABLE 2

MEAN SCORES ON TEXTBOOK SCIENCE ACHIEVEMENT TESTS FORM A AND FORM B BY PILOT STUDY GROUP
N=48

Pilot Group	Form A	Form B
Third Graders		
mean	14.36	13.25
s.d.	5.05	2.93
Fourth Graders		
mean	15.54	19.16
s.d.	7.23	4.55
Total Group		
mean	15	16.21
s.d.	6.22	4.81

six weeks, with lessons lasting 45 minutes each Monday, Tuesday and Wednesday.

After examining the science curriculum guide, trade books were selected to meet the same objectives as Unit 5 in the text. The list of books used is in Appendix D. They were used by the experimental group for a period of six weeks, each Monday, Wednesday and Thursday, for a 45 minute time slot. Some examples of trade books used are: Pollution: The Population Explosion (Jones, 1973), Who Lives in This Log? (Ross, 1971), The Birth of Sunset's Kittens (Stevens, 1969), and The Hidden Life of Flowers (Guilcher, 1971).

Daily lessons were planned and titles of and reading assignments in trade books were posted each day. Students had to read the required pages when the book or books were available.

Experimental Design

Pretests were given to assess attitudes toward science and to measure previous knowledge of concepts presented in the unit.

This is a nonequivalent control group, as both the control and experimental groups are intact classes. They were pregrouped at the beginning of the school year by the principal with input from the third grade teachers and the reading specialist. The design for this study is:

PRETEST-POSTTEST NONEQUIVALENT
CONTROL GROUP DESIGN

O_1	X_1	O_2
O_3	X_2	O_4

O_1 = Pretest, experimental group

O_2 = Posttest, experimental group

O_3 = Pretest, control group

O_4 = Posttest, control group

X_1 = treatment, use of trade books for science

X_2 = treatment, use of textbook for science

The teaching of the unit lasted six weeks.

Posttests were administered by the examiner as each class completed the unit. The purpose of the posttests were to assess attitude towards the school subject science and to measure learning of the unit concepts. The effects of the treatment were assessed by an analysis of the means obtained by each group on the attitude and achievement measures.

Scoring

Scoring was done by the examiner. On the textbook achievement test, one point was given for each correct answer on the multiple choice section and five points was the maximum allowed on the essay questions. This gave a

possible total of 37 points.

On the true/false test one point was given for each correct answer for a total possible of 25 points.

The Purdue attitude scale was evaluated by the median scale value of the statements endorsed. This scale is a Thurstone scale. Each statement has been given a value. The value of the median value endorsed, is the score for the scale. The point of indifference is 6.0. Scores above 6.0 indicate a favorable attitude towards science, and below 6.0 indicates an unfavorable response. For the purposes of this study, a score of 6.0 indicated a favorable response.

Analysis of Data

The pretests showed the control group and the experimental group not to be significantly different. The means and standard deviations for each group on each test were computed, analyzed and compared. The means on the science achievement tests and the science attitude tests were analyzed using a t-test. A t-test is a statistical test that allows comparison of two means to determine the probability that the difference between the two means is a real difference rather than a chance difference. (Tuckman, 1978) The results are shown in Table 3.

On the textbook achievement test the control group's mean was 15.88 with a standard deviation of 4.04. The

TABLE 3

MEAN SCORES OF CONTROL AND EXPERIMENTAL GROUPS ON PRETEST MEASUREMENTS OF ACHIEVEMENT AND ATTITUDE
N=47

Group	Achievement Textbook Test	Attitude Purdue Scale
Control		
mean	15.88	7.56
s.d.	4.04	1.01
Experimental		
mean	14.70	7.38
s.d.	7.3	.92

mean of the experimental group was 14.70 with a standard deviation of 7.3.

On the Purdue scale the mean of the control group was 7.56 with a standard deviation of 1.01. The experimental group's mean was 7.38 with a standard deviation of .92.

The results indicate that the groups were not significantly different.

CHAPTER IV

FINDINGS AND DISCUSSION

The purpose of this study was to measure effects on achievement in and attitude towards the school subject science when using trade books rather than the traditional textbook to meet the unit objectives.

A pretest was given to measure previous knowledge of the unit's concepts. This test was based on the textbook publisher's test. A measure of attitude, A Scale to Measure Attitude Toward Any School Subject (Remmers, 1960), was also given as a pretest.

For six weeks the two groups progressed through the objectives of the science unit on "Animal and Plant Populations." The control group used the textbook and the experimental group used trade books selected to meet the objectives of the unit.

Upon completion of the science unit, each group was tested with the alternate forms of the textbook achievement test and the attitude measure. In addition, a true/false achievement test was designed to balance any bias towards the control group which used the textbook.

All data was analyzed using a t-test, which allows

comparison of two means to determine if the probability of the difference obtained is real and not due to chance.

Analysis of Mean Scores

Mean scores were computed for each of the posttest measures. These are reported in Table 4. The t-test performed on the means for the textbook achievement test produced a statistical value of .72. This was not significant. On the true/false achievement test the statistical value of .235 was not significant. The attitude scale produced a statistical value of .29, which is not significant. The results of the analysis are in Table 5.

Findings

The results seem to indicate that there was no difference in achievement nor attitude by either the control group, which used the science textbook or the experimental group, which used the science trade books.

Discussion

In this study there was clearly no significant difference in the achievement or attitude of the fourth graders through the use of trade books in the science unit on "Animal and Plant Populations."

A number of factors may have contributed to the lack of significant difference in achievement and attitude as shown by this study. Some of these factors are:

1. The use of trade books rather than a textbook was

TABLE 4

MEAN SCORES OF THE CONTROL AND EXPERIMENTAL GROUPS ON POSTTESTS TO MEASURE ACHIEVEMENT AND ATTITUDE
N=47

Group	Achievement Measures Textbook Test	Achievement Measures True/False Test	Attitude Measure Purdue Scale
Control			
mean	30.33	20.42	7.15
s.d.	5.35	2.36	1.22
Experimental			
mean	29.30	20.22	7.02
s.d.	4.53	3.37	1.32

TABLE 5

ANALYSIS (T-TEST) OF MEAN SCORES ON ACHIEVEMENT AND ATTITUDE MEASURES

Measures	t-test statistical value
Achievement Measures	
Textbook Test	.72
True/False Test	.235
Attitude Measure	
A Scale to Measure Attitude Toward Any School Subject	.29

a new experience for these fourth graders. A study lasting six weeks may not have been long enough to change their attitudes toward science.

2. In general, attitude toward science, as measured by the Purdue scale pretest, was a positive one for both groups. The mean score for the control group was 7.56, and for the experimental group was 7.38. A score above 6.0 indicates a positive attitude towards science. The posttest results were also above the 6.0 rating, again maintaining the positive attitude.

3. Because of the limited quantities of each trade book, (in most cases there was one copy, and in others, there were two) students had to wait to read a trade book until someone else was finished with it. Students did become frustrated if they were ready to read the assignment, but the book was being read by someone else.

4. The textbook achievement measure did have content validity in that it tested the concepts introduced through the text. However, several of the questions were ambiguously worded. This may have affected the understanding by the students. Therefore, these ambiguities may have influenced the reliability of this achievement measure.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to assess the effects on achievement in and attitude towards the school subject science when using trade books rather than a textbook to meet unit objectives.

A pretest was given to measure previous knowledge of the unit concepts. This test was based on the textbook publisher's test. A measure of attitude was also used. The attitude measure was A Scale to Measure Attitude Toward Any School Subject (Remmers, 1960).

The study lasted six weeks, as the control and experimental groups progressed through the science unit "Animal and Plant Populations." The control group used the science textbook, and the experimental group used trade books to meet the same objectives.

Upon completion of the unit, each group was assessed with the alternate forms of the achievement and attitude measures. In addition, a true/false achievement test was designed to balance any bias toward the control group which used the textbook.

All data was analyzed using a t-test. The results

showed that there was no significant differences in science achievement nor attitude between the control and experimental group. The hypotheses of instructional content being enhanced by the use of trade books rather than a textbook was rejected.

Conclusions

On the basis of data obtained in this study, it was concluded that the use of trade books had no significant effect on the achievement or attitude of fourth graders in a science unit on "Animal and Plant Populations." However, this study does show that the students were able to achieve as well on the achievement measures when they used the trade books rather than the textbook.

It is possible that the results were influenced by the availability of the books. Multiple copies of the trade books would have prevented some of the frustration experienced when a student was ready to read the assignment but someone else was reading that trade book at that time.

Time may also have been a factor. Perhaps six weeks was too short of a time period to cause any change in attitude. In the Barrileaux study (1967), the eighth graders used the trade books and other library materials for a period of one year. This was a new experience for the fourth graders, who had been using one text in science for the past three and a half years. A longer period of time

may have been needed to influence attitude.

Clinical Aspects

While there were no significant changes in achievement and attitude as measured by pen and paper tests, it is important to relate some of the students' comments about the study.

After posttesting, the examiner spent time with each group. The study and its purposes were explained, and the students were invited to make remarks.

Several students in the control group thought it would be wonderful to have many trade books instead of one text. Only a few in the experimental group expressed positive feelings toward the use of the trade books. These few enjoyed having many books from which they could get information. However, the majority felt strongly about having one book each that could be kept in the student's desk, and would not have to be shared with anyone.

Perhaps after three-and-a-half years in the elementary school, the students were conditioned to obtain information from and to find answers in textbooks. This attachment to texts may have been a barrier to changes in attitude in this study. Several students did not like having to read through one or two pages in three different trade books, but stated they would rather have all the answers in one text. Students also expressed frustration because they had to wait for someone to finish reading one

of the trade books. As previously mentioned, having several copies of each trade book could solve this problem.

Several weeks after the completion of the study, two students in the experimental group needed to obtain information about tadpoles, and they chose to get that information from three different trade books in the library. When asked why they used the trade books, they replied that their textbook had only limited information. Their tadpole was dying and they needed specific information, which they found in the trade books. When asked why they didn't use the encyclopedia, one of the youngsters replied that more information could be obtained from the trade books solely devoted to tadpoles. When asked if they had ever before used a trade book for such an information search, their answer was that they had not. Somehow they felt that the trade book would have the answer. So far, their tadpole is still living.

This example of using trade books to solve a problem may be a resulting effect of this study not measured by a pen and paper test.

Suggestions for Further Research

Since this study assessed achievement and attitude toward science with the use of trade books rather than a textbook with fourth grade students, several suggestions for further research are offered.

A similar study could be conducted; however, the time period could be longer, possibly a year. This may provide more of a chance to affect attitude. Also, as in the Barrilleaux study, assessment of achievement and attitude could be made a year later to measure any long-term effects.

Assessments could be made as to the effectiveness of the use of trade books in other content areas, such as social studies.

Further studies could examine and compare the effectiveness of trade books in relation to each other. The selection of trade books used in a study such as this, could be a critical factor. Certain trade books could be more effective in teaching an objective. This could be examined in other content areas, also.

BIBLIOGRAPHY

Abruscato, J., Hassard, J., Fossaceca, J. W., & Peck, D. Elementary science. New York: Holt, Rinehart, and Winston, 1980.

Allen, H. Attitudes of certain high school seniors toward science and scientific courses. New York: Bureau of Publications, Teachers College, Columbia University, 1960.

Allison, R. W. The effect of three methods of treating motivational films upon the attitudes of fourth-, fifth- and sixth-grade students toward science, scientists and scientific careers. Unpublished doctoral dissertation, Pennsylvania State University, 1966.

Arbuthnot, M. H. Children and books. Glenview, Illinois: Scott, Foresman and Co., 1964.

Asimov, I. Science fiction: Clue to creativity. Library Journal, 1964, 89, 14-17.

Barrilleaux, L. E. An experiment on the effects of multiple library sources as compared to the use of a basic textbook in junior high school science. The Journal of Experimental Education, 1967, 35, 27-35.

Bauer, R. C. Effects of folktales as bibliotherapeutic aids in changing attitudes of seventh grade remedial readers. Unpublished masters thesis, Rutgers University, 1977.

Billig, E. Children's literature as a springboard to content areas. The Reading Teacher, 1977, 30, 855-859.

Brice, R., & Fox, B. Conceptual themes: A basis for relating science and literature. Science and Children, 1977, 15, 18-20.

Carin, A. A., & Sund, R. B. Teaching science through discovery. Columbus, Ohio: Charles E. Merrill, 1970.

Chambers, D. W. ...Let them read. The Reading Teacher, 1966, 20, 247-254.

Chambers, D. W. Children's literature in the curriculum. Chicago: Rand McNally and Co., 1971.

Cohen, D. H. The effect of literature on vocabulary and reading achievement. Elementary English, 1968, 14, 209-213, 217.

Dawson, M. A. Literature enlivens the social studies. Education, 1965, 85, 294-297.

Eakin, M. K. The changing world of science and the social sciences. Top of the News, 1970, 27, 23-31.

Fisher, B. Using literature to teach science. Journal of Research in Science Teaching, 1980, 17, 173-177.

Fry, E. Fry's readability graph: Clarifications, validity, and extension to level 17. Journal of Reading, 1977, 21, 242-252.

Fry, E. A reappraisal of formula writing. Publishers Weekly, 1979, 215, 41.

Frye, H. What about science books. Top of the News, 1964, 21, 27-31.

Gross, P., & Mayo, D. E. Preparing the elementary teacher for science: A new direction. Science and Children, 1969, 7, 21-24.

Hartill, B. C. Building social studies concepts through trade books. Childhood Education, 1966, 43, 150-153.

Huck, C. S., & Kuhn, D. Y. Children's literature in the elementary school. New York: Holt, Rinehart, and Winston, 1968.

Keach, E. T. Social studies instruction through children's literature. Elementary School Journal, 1974, 75, 98-102.

Kuslan, L. I., & Stone, A. H. Teaching children science: An inquiry approach. Belmont, California: Wadsworth Publishing, 1972.

Lembesis, A. C. Reaching remedial readers through science. Education, 1965, 85, 288-293.

Main, E. Interrelating science with other subjects. Science and Children, 1981, 18, 26-27.

Mallinson, G. G., Sturm, H. E., & Patton, R. E. The reading difficulty of textbooks in elementary science. Elementary School Journal, 1950, 50, 460-463.

McWilliams, L., & Rakes, T. A. Assessing reading skills in science. Science and Children, 1980, 17, 21-22.

Moore, H. D. The teacher's right arm, cooperation in teaching science. Science Education, 1966, 50, 50-52.

Remmers, H. H. Manual for the Purdue master attitudes scales. West Lafayette, Indiana: Purdue Research Foundation, 1960.

Sebesta, S. Using children's literature effectively. In J. Catterson (Ed.), Children and literature. Newark, Delaware: International Reading Association, 1970.

Selsam, M. Writing about science for children. In S. I. Fenwick (Ed.), A critical approach to children's literature. Chicago: The University of Chicago Press, 1967.

Stewig, J. W. Children and literature. Chicago: Rand McNally College Publishing Co., 1980.

Sutherland, Z., & Arbuthnot, M. H. Children and books. Glenview, Illinois: Scott, Foresman and Co., 1977.

Troy, A. Literature for content area learning. The Reading Teacher, 1977, 30, 470-474.

Tuckman, B. W. Conducting educational research. New York: Harcourt, Brace, Jovanovich, Inc., 1978.

Whitehead, R. Children's literature: Strategies of teaching. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1968.

Wundheiler, L. A psychological basis for judging children's literature dealing with nature and science. In S. I. Fenwick (Ed.), A critical approach to children's literature. Chicago: The University of Chicago Press, 1967.

APPENDIX A

TEXTBOOK ACHIEVEMENT TESTS

Form A
Form B

Unit 5 ANIMAL AND PLANT POPULATIONS

Form A

NAME_____CLASS_____DATE_____

Read each question. Choose the best answer from those listed. Write the letter of your choice on the line at the right.

1. Jim counted 52 tulips in a field. Jim has counted
   a. a population.
   b. an organism.
   c. 52 different plants.
   d. all organisms in the field. 1.___

2. An organism is
   a. a living thing.
   b. part of the soil.
   c. part of the air.
   d. part of the body. 2.___

3. A population is
   a. two organisms.
   b. any group of organisms
   c. a group of organisms of the same kind.
   d. everything living in the desert. 3.___

4. Populations are found
   a. only in the soil.
   b. only in forests.
   c. only in the air.
   d. everywhere on earth. 4.___

5. A person who studies living things is a(n)

   a. geologist.

   b. biologist.

   c. astronaut.

   d. machinist. 5._____

6. A small part of the whole population is a(n)

   a. organism.

   b. sample.

   c. tree.

   d. forest. 6._____

7. Population size is

   a. never important.

   b. often important.

   c. foolish.

   d. something only scientists need to know. 7._____

8. Birth is important if a population wishes to

   a. become smaller.

   b. grow and survive.

   c. waste energy.

   d. cause pollution. 8._____

9. To make more of the same kind of organism is to

   a. reproduce.

   b. make pollen.

   c. die.

   d. stigma. 9._____

10. An animal that reproduces by budding is

    a. salmon.

    b. amoeba.

    c. hydra.

    d. brine shrimp. 10._____

11. Which of the following is <u>not</u> part of a flower?

    a. an anther.

    b. pollen.

    c. a hydra.

    d. a stigma. 11._____

12. For fertilization to take place, pollen must travel from anther to

    a. the seed.

    b. the runners.

    c. the buds.

    d. the stigma. 12._____

13. Rapid growth of a population is called a

    a. population explosion.

    b. population power.

    c. population control.

    d. growth. 13._____

14. Populations decrease if

    a. there are more deaths than births

    b. members move into the area.

    c. there are more births than deaths.

    d. there is a population explosion. 14._____

15. Everything in the surroundings that affects an organisms's life is called that organism's

    a. home.

    b. shelter.

    c. environment.

    d. place. 15._____

16. Caribou can live in cold places because they

    a. have thick fur.

    b. have narrow feet which helps them move across snow.

    c. do not need much water.

    d. eat snow. 16._____

17. A cactus can grow in deserts because

    a. it does not need much water.

    b. it does not need much light.

    c. it needs a lot of water.

    d. it does not have green leaves. 17._____

18. The difference in size between the tallest and shortest organism in a population is called the

    a. change.

    b. variation.

    c. range.

    d. extinction. 18._____

19. The giraffe's long neck helps it survive because

    a. it can reach food that other animalse cannot reach.

    b. it can be seen by enemies.

    c. it also has long legs.

    d. it can drink more water. 19._____

20. You are an insect living in the grass. The best color to be, in terms of survival, is

    a. red.

    b. yellow.

    c. blue.

    d. green. 20._____

21. Which of the following organisms is extinct?

    a. dolphins.

    b. dinosaurs.

    c. whales.

    d. eagles. 21._____

22. Which of the following actions helps plants and animals to survive?

    a. unnecessary killings.

    b. changes in weather over a long time.

    c. laws to protect them.

    d. using animal skins for clothes. 22._____

Follow the directions below to answer the questions.

1. What are three populations that you can find near your home?

_____

_____

_____

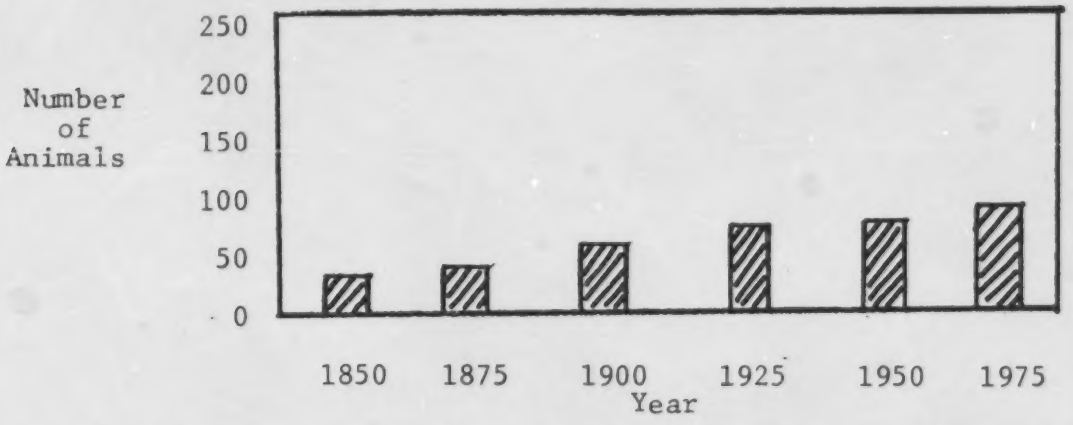
2. Why are camels able to live in the desert and caribou able to live in cold areas?

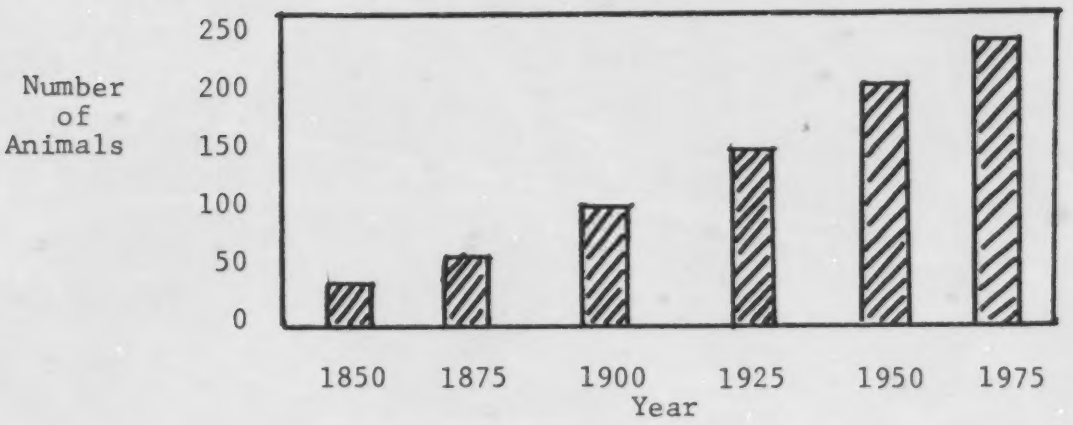
_____

_____

_____

3. Which graph shows a population explosion? Explain your answer.





Unit 5 ANIMAL AND PLANT POPULATIONS

Form B

NAME_____ CLASS_____ DATE_____

Read each question. Choose the best answer from those listed. Write the letter of your choice on the line at the right.

1. Which sentence is not true?
   a. Plants are organisms.
   b. Animals are organisms.
   c. Most organisms are the same size.
   d. Plants can grow through cracks in rocks. 1._____

2. Which is not an organism?
   a. a snake.
   b. a forest.
   c. a dog.
   d. a rose. 2._____

3. Organisms are usually found
   a. alone.
   b. in groups.
   c. in water.
   d. underground. 3._____

4. Which is a population?
   a. a goldfish.
   b. a rock.
   c. a flock of geese.
   d. a rabbit. 4._____

5. The size of a population is found by

   a. guessing.

   b. using a ruler.

   c. watching television.

   d. counting. 5._____

6. Jill wanted to know how many buttercups were in a field. She took five sample counts. She must now find

   a. an average sample count.

   b. a calculator.

   c. another field.

   d. the number of insects. 6._____

7. Adding the sample counts and dividing by the number of counts gives a(n)

   a. count.

   b. range.

   c. average.

   d. sample. 7._____

8. When eggs hatch, the size of the population

   a. increases.

   b. decreases.

   c. stays the same.

   d. does not change. 8._____

9. An amoeba is an animal that

   a. hatches from eggs.

   b. divides in half.

   c. buds.

   d. pollinates. 9._____

10. A kind of animal that gives birth to living young is the

    a. amoeba.

    b. hydra.

    c. brine shrimp.

    d. cat. 10._____

11. Anthers make a yellowish powder called

    a. pollen.

    b. runners.

    c. buds.

    d. stigma. 11._____

12. A new potato plant will grow from

    a. trees.

    b. buds.

    c. runners.

    d. eggs. 12._____

13. Populations increase if

    a. members move out of the area

    b. there is disease among the members.

    c. there are more births than deaths.

    d. there are more deaths than births. 13._____

14. Population explosions

    a. are nothing to worry about.

    b. can cause problems.

    c. are common.

    d. only happen to rabbits. 14._____

15. If a population gets too large

    a. food supplies increase.

    b. disease can spread faster.

    c. living space increases.

    d. organisms will not starve to death. 15._____

16. Rabbits live in a forest because they

    a. have thick fur.

    b. eat green plants.

    c. do not need much water.

    d. need a cold environment. 16._____

17. The movement of animals from one place to another is called

    a. population.

    b. pollution.

    c. migration.

    d. pollination. 17._____

18. Trees stop growing at the tree line of a mountain because

    a. the water level is low.

    b. the temperature is too cold.

    c. there is not enough light.

    d. the temperature is too warm. 18._____

19. The largest animals on earth are

    a. giraffes.

    b. monkeys.

    c. elephants.

    d. blue whales. 19._____

20. Differences among members of the same population are

    a. changes.

    b. extinctions.

    c. variations.

    d. ranges. 20._____

21. Variations that help an organism survive are

    a. passed on to their newborn.

    b. b. not helpful.

    c. harmful to the organism.

    d. soon destroyed. 21._____

22. Which of the following organisms is in danger of becoming extinct?

    a. passenger pigeon.

    b. bald eagle.

    c. dinosaur.

    d. labrador duck. 22._____

Follow the directions below to answer the questions.

1. How is a population different from an organism?

_____

_____

_____

_____

2. What two problems can occur if a population gets too large?

_____

_____

_____

3. Label each organism as endangered or extinct. What is the difference between extinct and engangered organisms?

_____

_____

_____

_____

_____

_____

APPENDIX B

TRUE/FALSE ACHIEVEMENT TEST

Science Unit 5 Animal and Plant Populations

SCORE_____

NAME_____ CLASS_____ DATE_____

DIRECTIONS: Read each sentence carefully. Think about what you are reading. Decide if the statement is true or false. If it is true, circle the word true. If it is false, circle the word false.

1. TRUE FALSE A rock is an organism.
2. TRUE FALSE You can find organisms inside an old log.
3. TRUE FALSE Ants, worms, and other bugs that live in the soil, are a population.
4. TRUE FALSE To find a population's size, you must count every living thing in that population.
5. TRUE FALSE Knowing a population's size is not important.
6. TRUE FALSE Some animals reproduce by dividing in half.
7. TRUE FALSE All animals are born by dividing, hatching, or budding.
8. TRUE FALSE A cat is an example of an animal that gives birth to live young.
9. TRUE FALSE Birth is not important to the survival of organisms.

10. TRUE FALSE All plants need seeds to grow.

11. TRUE FALSE A part of the flower called the stigma, makes pollen.

12. TRUE FALSE Some plants grow new plants from a stem, a root, or a leaf.

13. TRUE FALSE Rapid increase of a population is called growth.

14. TRUE FALSE Populations increase if there are more deaths than births.

15. TRUE FALSE If a population becomes too large, there are no problems.

16. TRUE FALSE Camels can survive in the desert because of their size.

17. TRUE FALSE An organism's surroundings is called its environment.

18. TRUE FALSE Caribou can live in cold regions because of their thick fur.

19. TRUE FALSE One reason why some birds migrate is to find food.

20. TRUE FALSE Cactus can grow in the desert because cactus do not need light.

21. TRUE FALSE The difference in size between the tallest and the shortest organisms is the average.

22. TRUE FALSE Color is one variation that helps an organism to survive.

23. TRUE FALSE Animals that no longer exist are called endangered.

24. TRUE FALSE Some animals are endangered because of the actions of human beings.

25. TRUE FALSE The dinosaur is an extinct animal.

APPENDIX C

A SCALE TO MEASURE ATTITUDE TOWARD ANY SCHOOL SUBJECT

Form A
Form B

FORM A

Edited by H. H. Remmers

Date_____

Name_____

Directions: Following is a list of statements about school subjects. I would like you to think about these statements and your feelings about the school subject, science. Put a plus sign (+) before each statement with which you agree about science. Your answers will not affect your grade. Remember you are to think about your feelings towards the school subject, science.

_____ 1. No matter what happens, this subject always comes first.

_____ 2. This subject has an irresistable attraction for me.

_____ 3. This subject is profitable to everyone who takes it.

_____ 4. Any student who takes this subject is bound to be benefited.

_____ 5. This subject is a good subject.

_____ 6. All lessons and all methods used in this subject area are clear and definite.

_____ 7. I am willing to spend my time studying this subject.

_____ 8. This subject is a good pasttime.

_____ 9. I don't believe this subject will do anybody any harm.

_____10. I haven't any definite like or dislike for this subject.

_____11. This subject will benefit only the brighter students.

_____12. My parents never had this subject, so I see no merit in it.

_____13. I am not interested in this subject.

_____14. This subject reminds me of Shakespeare's play--"Much Ado About Nothing."

_____15. I would not advise anyone to take this subject.

_____16. This subject is a waste of time.

_____17. I look forward to this subject with horror.

Copyright, Purdue Research Foundation, 1960

FORM B

Edited by H. H. Remmers

Date _____

NAME _____

Directions: Following is a list of statements about school subjects. I would like you to think about these statements and your feelings about the school subject, science. Put a plus sign (+) before each statement with which you agree about science. Your answers will not affect your grade. Remember you are to think about your feelings towards the school subject, science.

_____ 1. I am "crazy" about this subject.

_____ 2. I believe this subject is the basic one for all high school courses.

_____ 3. This subject fascinates me.

_____ 4. This subject will help pupils socially as well as intellectually.

_____ 5. This subject is interesting.

_____ 6. All methods used in this subject have been thoroughly tested in the classroom by experienced teachers.

_____ 7. Every year more students are taking this subject.

_____ 8. This subject has its drawbacks, but I like it.

_____ 9. This subject might be worthwhile if it were taught right.

_____10. My likes and dislikes for this subject balance one another.

_____11. This subject is all right, but I would not take any more of it.

_____12. No student should be concerned with the way this subject is taught.

_____13. This subject has numerous limitations and defects.

_____14. This subject seems to be a necessary evil.

_____15. All the material in this subject is very interesting.

_____16. This subject has no place in the modern world.

_____17. This subject is all bunk.

Copyright, Purdue Research Foundation, 1960

APPENDIX D

TRADE BOOKS USED BY EXPERIMENTAL GROUP

Alexander, T. R., Burnett, R. W., & Zim, H. S. Botany. New York: Golden Press, 1970.

Asimov, I. ABC's of Ecology. New York: Walker and Company, 1972.

Berrill, J. Wonders of Animal Migration. New York: Dodd, Mead and Company, 1964.

Blough, G. O. Who Lives in This Meadow? New York: McGraw-Hill Book Company, 1961.

Buck, M. W. In Ponds and Streams. New York: Abingdon Press, 1955.

Buck, M. W. In Yards and Gardens. New York: Abingdon Press, 1952.

Burton, J. The How and Why Wonder Book of Extinct Animals. New York: Grosset and Dunlap, 1976.

Cloudsley-Thompson, J. Camels. Milwaukee: Raintree Children's Books, 1980.

Cole, J., & Wexler, J. A Chick Hatches. New York: William Morrow and Company, 1976.

Craig, M. J. Dinosaurs and more Dinosaurs. New York: Four Winds Press, 1968.

Feldman, A., & Ely, J. The Inflated Dormouse and Other Ways of Life in the Animal World. New York: The Natural History Press, 1970.

Foster, W. K., & Queree, P. Seeds are Wonderful. Chicago: Melmont Publishers, Inc., 1960.

Freedman, R. Animal Fathers. Middletown, Connecticut: Xerox Education Publications, 1976.

Garelick, M. What's Inside? New York: Scholastic Book Services, 1968.

Guilcher, J. M., & Noailles, R. H. The Hidden Life of Flowers. New York: Sterling Publishing Company, 1971.

Halmi, R. In the Wilds of North America. New York: Four Winds Press, 1971.

Holmes, S. Flowers of the World. New York: Grosset and Dunlap, 1975.

Jones, C., Gadler, S., & Engstrom, P. Pollution: The Population Explosion. Minneapolis: Lerner Publications Company, 1973.

The Jungle. New York: MacDonald Educational, 1975.

Kilpatrick, C. Giraffes. Milwaukee: Raintree Children's Books, 1980.

Kirkpatrick, R. K. Look at Flowers. Milwaukee: Raintree Children's Books, 1978.

Kirkpatrick, R. K. Look at Trees. Milwaukee: Raintree Children's Books, 1978.

Lavine, S. A. Wonders of the Cactus World. New York: Dodd, Mead and Company, 1974.

Lewis, L. Z. The First Book of Microbes. New York: Franklin Watts, Inc., 1972.

McGowen, T. Album of Prehistoric Animals. New York: Rand McNally and Company, 1974.

Morris, D. Endangered Animals. Milwaukee: Raintree Children's Books, 1977.

Parker, B. M. Adaptation to Environment. Evanston, Illinois: Row, Peterson and Company, 1960.

Parker, B. M. Balance in Nature. Evanston, Illinois: Row, Peterson and Company, 1960.

Rivers and River Life. New York: Macdonald Educational, 1975.

Ross, W. S. Who Lives in This Log? New York: Coward, McCann and Geoghegan, Inc., 1971.

Selsam, M. E. How Kittens Grow. New York: Scholastic Book Services, 1973.

Selsam, M. E. How Puppies Grow. New York: Scholastic Book Services, 1971.

Selsam, M. E. Play with Plants. New York: William Morrow and Company, 1949.

Selsam, M. See Through the Forest. New York: Harper and Row, 1956.

Selsam, M. See Through the Jungle. New York: Harper and Row, 1957.

Stevens, C. The Birth of Sunset's Kittens. New York: Young Scott Books, 1969.

Venning, F. D. Cacti. New York: Golden Press, 1974.

Waters, J. F. Camels Ships of the Desert. New York: Thomas Y. Crowell Company, 1974.

Wood, D. Plants with Seeds. Chicago: Follett Publishing Company, 1963.

Wong, H. H., & Vessel, M. F. Pond Life: Watching Animals Grow Up. Reading, Massachusetts: Addison-Wesley Publishing Company, Inc.

Zim, H. S. What's Inside of Plants? New York: William Morrow and Company, 1952.